

When to Spray—What Solutions to Use How to Mix Them

Fruits, Vegetables, Flowers, Shade Trees, &c.

For applying these solutions in the right way, we have 50 or more combinations from which to choose the right outfit for your purpose.

IRON AGE Bucket, Knapsack, Barrel,
Power and Traction Sprayers

Which can be built up and combined as your
need for them increases.

Construction features include

Outside pumps—no corrosion. Brass parts where solutions come in contact. Hemp packing with lead core and bronze ball valves, all easily got at when necessary. Handle any kind of solutions, hot or cold. Steel pipe or bamboo rods with all necessary orchard equipment. Best quality high pressure hose. Large oil chamber. Nozzle of modern pattern, our own manufacture. Nozzle strainers with every lead of hose.

In 1911 an expert, exhaustive test was conducted in New York State by disinterested parties who wanted the best pump for certain spraying operations. The "Iron Age" Double Acting Pump was shown to have the least slippage among eight of the best Spray Pumps tested. Perfect efficiency in a pump means that it delivers all of the water or solution that it takes in—100 per cent.—the slippage means the percentage of loss, and "Iron Age" Pumps had the least in this thorough test.

6-Row Traction Sprayer in Potatoes.

Bateman M'f'g Co.
GRENLOCH, N. J., U. S. A.



Ask for new booklet, "SPRAYING VINES, TREES AND BUSHES."

Property of Jason Adam

Spray Calendar for Fruits

Numbers after the Solutions show where the formulas, etc. are to be found on pages 6 and 7. We are indebted to the Ohio Experimental Station Bulletin No. 232 for this information.

WHAT TO SPRAY	FOR WHAT TO SPRAY	WITH WHAT TO SPRAY	WHEN TO SPRAY				REMARKS AND CAUTIONS
			FIRST SPRAYING	SECOND SPRAYING	THIRD SPRAYING	FOURTH SPRAYING	
APPLE	Bitter rot	Bordeaux 35 or No. 34 and 22	With first appearance of rot about July 1st, Bord. 35 or No. 34	One to two weeks after first, 22	Two weeks later	Not required if Bordeaux precedes	These follow sprays for scab; danger on fair-skinned apples.
	Blotch	Bordeaux 35 or No. 34 and 22	July 1st Bordeaux 35 or No. 34	Two weeks later ammoniacal cop. carb.	Two to three weeks later	.....	These sprays follow spraying for scab.
	Black rot	Probably 34 on red apples	Same as bitter rot	.....	.....	.....	For black rot follow scab sprays closely, using Bordeaux and Iron Sticker as long as safe.
	Rust	Same as scab and bitter rot	Same as scab and bitter rot	.....	.....	.....	.....
	Scab	Bordeaux 20 or 33, or lime-sulphur	Just before blossoms open, Bordeaux 20	Just after blossoms drop, 20, No. 33 or lime-sulphur	Same 7 to 10 days later	Rarely needed	The spray just before the blossoms open is very essential for scab. Bordeaux advised for first and second on varieties susceptible to scab. On Ben Davis and Baldwin, lime-sulphur good for second & third.
	Sooty fungus	No. 34 or Bordeaux 35	After blossoms drop (see scab)	Two weeks later	Same as Bordeaux for scab	Bordeaux 20 or No. 33	Midsummer copper sprays needed where lime-sulphur is used early in the season (see blotch).
	Canker worm	Arsenate of lead alone. Band with tree tanglefoot	With first young worms	Two or 3 days later if worms remain	Same as second	.....	Bands should be in place by February 15.
	Codling moth	Arsenites or arsenates in Bordeaux 20 or 30 or lime-sulphur solution with arsenate of lead 3 lbs. to 50 gallons	As soon as blossoms fall	Seven to 10 days later	Second week in July	Last week in July. Arsenate of lead alone on light-colored apples	.....
	Curculio	Same as above	Same as above	Same as above	Same as above	Same as above	.....
	San Jose scale	Lime-sulphur or 16	Late in Winter, early in Spring, or late in Fall	.....	.....	.....	In case of bad infestation, spray in Fall and repeat in Spring.
	Oyster-shell scale	{ Lime-sulphur Kerosene emulsion or 16	{ Early Spring with 17	June 1 to 15 with lime-sulphur or 12 or 16	For oyster-shell scale August 1 to 15 with 12 or 16	.....	{ Don't use strong emulsion or oil when trees are in full leaf.
	Scurfy scale						
	Wooly aphis	Kerosene emulsion	When trees are in full leaf	In Fall	.....	.....	.....
CHERRY STOCKS	Leaf spot	Bordeaux 35 or No. 27	When leaves are half grown	Two weeks later	Two weeks later	About two weeks later	.....
CHERRY	{ Leaf spot... { Mildew.... }	Bordeaux 35 or No. 27	When leaves are unfolding	Two weeks later	Two or 3 weeks after second	.....	First after blossoming. Often necessary to treat repeatedly after crop is gathered. Use 22 or 21 when fruit is large. No. 27 on sweet cherries.
	Rot	Bordeaux 20 and 35	Before blossoming, 20	After blossoms drop, 35 on fruit	Two weeks later, 35 on fruit	Two weeks later, 35, 22 or 21	Difficult to reach aphis. Use 1 lb. of soap to 4 gallons of water.
	Aphis	Soap solution	On first appearance of aphis	.....	.....	.....	Air-slaked lime may be used when trees are carrying fruit.
	Cherry slug	Arsenate of lead in Bordeaux 20 or No. 27	After fruit harvest when slugs appear	Repeat if slugs remain	.....	.....	Avoid strong solutions. Do not use other arsenicals than arsenate of lead.
	Curculio	Arsenate of lead in Bordeaux 20 and 35 or in 27	Before blossoming in 20	As blossoms dry up in 35	One week later in 35	.....	.....
CURRANT	Leaf spot	Bordeaux 20	As leaves are unfolding	Two weeks later	Two weeks later	Two or 3 weeks later	Fourth necessitates washing fruit.
	Plant bug	Kerosene emulsion or 16	May	Early in June if necessary	.....	.....	.....
	San Jose scale	Lime-sulphur or 16	As with apple	In Spring as with apple	.....	.....	.....
	Worm	White hellebore, arsenate of lead	When worms first appear. Arsenate of lead when in bloom	In 3 or 4 days repeat	Repeat as second	.....	Look for worms on under side of leaves first.

Spray Calendar for Fruits (Continued)

WHAT TO SPRAY	FOR WHAT TO SPRAY	WITH WHAT TO SPRAY	WHEN TO SPRAY				REMARKS AND CAUTIONS
			FIRST SPRAYING	SECOND SPRAYING	THIRD SPRAYING	FOURTH SPRAYING	
GOOSEBERRY	Leaf spot	Bordeaux 20	As currants with leaf spot	As currants with leaf spot	As currants with leaf spot	As currants with leaf spot	Bordeaux coats fruits if used for third.
	Mildew	Bordeaux 20 or 23	Before leaves open, Bordeaux 20	After blossoming, 20	Potassium sulphid two weeks later.	.....
	Worm	White hellebore or arsenate of lead	As on currants				
GRAPE	Anthraxnose	Bordeaux 20	Just before buds open	Just before blossoming	Just after fruit has set	Ten days later Bordeaux	Follow by two or three sprayings with soda Bordeaux or am. cop. carbonate. Repeat treatments at short intervals until insects are exterminated. Continue at intervals of one week or oftener as long as necessary.
	Berry moth	Arsenate of lead with Bordeaux 20 or 33	Before bloom	After fruit has set	July 1 to July 15		
	Downy and powdery mildew	Bordeaux 20 or 33	Just before blossoming	After fruit has set	Ten to 15 days later		
	Rot	Bordeaux 20 or 33 and 22 or 21	Just before blossoming Bordeaux 20 or 33	Just after fruit has set 20 or 33	Seven or 8 days later	Seven or 8 days later, Bordeaux 20 or 33	
	Leaf hopper	Kerosene emulsion, 16 or strong tobacco decoction	Before young can fly	.....	.....	.....
	Rose bug	Arsenate of lead and glucose in water	Soon as bugs appear	Two or 3 days later	One week later	One week later	
MUSKMELON	Anthraxnose	Bordeaux 20 and 35	In seed bed or when plants begin to vine, Bordeaux 35	Two weeks later, Bordeaux 20	Two weeks later	Two weeks later	Repeat as necessary; use 35 very early.
	Cucumber beetle	Arsenate of lead in Bordeaux 30					
	Downy mildew	Bordeaux 20	July 25 to August 1	Eight to 10 days later	Eight or 9 days later	Eight days later	
	Leaf blight	Bordeaux 20	When plants begin to vine	Three weeks later	Three weeks after second	Two weeks after third	Repeat same.
PEACH	Leaf curl	Bordeaux 20, 24 or 17	In Fall or March, Bordeaux 20, 27 or 17	As buds are opening, 20, 24 or 17	Just after calyx drops Bord. 35	Not required ditto third, if others are well done	Lime-sulphur for first instead of Bordeaux 20 when scale is present.
	Rot	Bordeaux 20, 17 and 27 or Bordeaux 35	As buds are swelling, 20 or 17	Just after calyx drops, 27 or Bordeaux 35	Three or 4 weeks later, 27	As fruit begins to color, 27	Every 7-10 days repeat. Destroy all mummies. 22 may be used 4th.
	Scab	Bordeaux 20, 24, 27 or 17	As buds are swelling, Bordeaux 20, 27, 23 or 17	Just after calyx drops, 27 or Bordeaux 35	Two weeks later, 27 or Bordeaux 33, 23	Repeat third	Twenty-seven is safest remedy in foliage.
	Bud moth	Arsenicals in Bordeaux 20	With opening of buds	.....	.....	.....	Use only half usual amount of poison.
	Curculio	Arsenate of lead and 27	Arsenate of lead 10 days after bloom falls	27 and arsenate of lead 10 days later			
	San Jose scale	Lime-sulphur	In late Fall or early Spring				
PEAR STOCKS	Leaf spot or blight	Bordeaux 20	When leaves are half-grown	Two weeks later	Two weeks later	Two weeks later	Five to 7 sprayings are needed.
PEAR	Leaf blight	Bordeaux 20 or 33 and 22 or 21	Before blossoms open	Two weeks later 20 or 33	Two weeks after second, 22	Bordeaux may russet fruit	Use 22 for third, not Bordeaux after second. Bordeaux after second may injure the fruit.
	Scab	Bordeaux 20	When leaves are half grown	After blossoms drop			
	Blister mite	Kerosene emulsion, miscible oil or lime-sulphur	When buds begin to swell in Spring	When leaves have fallen in Autumn.			
	Bud moth	Arsenicals in Bord. 20	With open'g of buds				
	Canker worm	Arsenate of lead	As with the apple	Same as first	.....	.....	See apple.
	Codling moth	Arsenicals in Bor. 20	In Winter or early Spring				
	San Jose scale	Lime-sulphur or 16	When slugs appear	Repeat if slugs remain			
	Slug	Arsenicals in Bor. 20 or dust with sla'd lime					
PLUM	Pockets or Bladders	Bordeaux 20 or lime-sulphur	In March 20, or 17	.....	.....	.....	Treat as for leaf curl of peach.
	Rot	Bordeaux 20, also 22 or 21. No. 27 on Am. & Jap. varieties	As buds are swelling, 20 or 17	Just after calyx drops 20 or 33	Three or 4 weeks later, 20 or 33	As fruit begins to color use 22 or 21	Every 7-10 days repeat 4th; useless to spray for rot, unless mummies are destroyed.

Spray Calendar for Fruits (Continued)

WHAT TO SPRAY	FOR WHAT TO SPRAY	WITH WHAT TO SPRAY	WHEN TO SPRAY				REMARKS AND CAUTIONS
			FIRST SPRAYING	SECOND SPRAYING	THIRD SPRAYING	FOURTH SPRAYING	
PLUM [CONT'D]	Shot-hole fungus Curculio	Bordeaux 20 or 33, also No. 27 Arsenate of lead in Bordeaux 20 or 27	When leaves are half grown With starting of buds	Three weeks later Just after calyx drops	Three weeks later, if needed Five days later	No. 27 on Am. & Jap. varieties	Protect to end of season. Jar, gather and destroy curculios and stung plums in addition. Use 1 lb. of soap to 6 gals. water.
	Aphis	Soap solution	On appearance of aphis	.....	.....	.....
	San Jose scale	Lime-sulphur or 16	In late Fall or early Spring				
QUINCE STOCKS	Leaf spot	Bordeaux 20	When leaves are half grown	About two weeks later	Two weeks later	Two weeks later	Perhaps 5th spraying will be needed
QUINCE	Leaf spot	Bordeaux 20 and 33	When leaves are half grown	.....	Two weeks later, 20 or 33	Two weeks later	First should come before blossoms open.
	Fruit and leaf spot	Bordeaux 20	Just before blossoms open	After blossoms drop	Two weeks after second	Two weeks later	
	San Jose scale	Lime-sulphur or 16	In late Fall or early Spring				
RASPBERRY and BLACKBERRY	Anthrachnose	Bordeaux 20 and 35	Before leaves open, use 20	35 on canes 6 in. high	Repeat 2nd one week later	.....	Keep spray from leaves of bearing canes. Remove old canes at once after picking and spray new canes very thoroughly.
	Cane blight	Bordeaux 35	On young canes just before blooming of old.	Immediately after fruit is gathered	Three wks. after second	.....
	Leaf spot	Bordeaux 20	When leaves are half grown	Two weeks later	Two weeks later	.....
	Rasp. Byturus	Arsenate of lead	Before beetles appear; about May 1	May 10th to 15th	.....	.....	Cultivate thoroughly in Fall to destroy and expose pupæ.
	Saw fly	Pyrethrum, hellebore or arsenate of lead	As for currant worm. Arsenate of lead as soon as leaves are out	In 3 or 4 days repeat			
STRAWBERRY	Leaf spot	Bordeaux 20, 33 or 27	On new growth after crop	Two or 3 weeks later			
WATER- MELON	Anthrachnose	Bordeaux 35	When plants begin to vine	Three weeks after first	Three weeks later	Three weeks later	Bordeaux 20, some danger
	Cucumber beetle	Arsenate of lead in Bordeaux 30					
	Downy mildew	Bordeaux 35	July 25 to Aug. 1	Eight to 10 days later	Eight to 9 days later		
	Leaf blight	Bordeaux 35	As disease appears on muskmelons	Repeat as on muskmelons	As on muskmelons	As for cucumber	

Spray Calendar for Vegetables

ASPARAGUS	Asparagus beetle Asparagus rust	Air-slaked lime Bordeaux (20)	When larvæ appear After cutting crop	Same as first Ten days later	Same as first Ten days later	Same as first Ten days later	Do not use arsenicals, except in late Summer. Repeat 3 or 4 times. Burn rusted brush in Fall.
BEAN	Anthrachnose	Bordeaux (20)	Soak seed 1 to 2 hrs. in am. cop. carb. five times strength of 22	Bordeaux on 2 or 3-in. plants	Bordeaux ten days later	After blossoms	Repeat if needed.
CABBAGE and CAULI- FLOWER	Cabbage worm Aphis or louse Downy mildew	Pyrethrum or Resin Lime (7) Kerosene Emul. (12) at the rate of 1 to 8 Bordeaux mix. (20)	With first appearance of worms	Whenever worms are observed	Same as second	Same as second	One oz. to 30 gallons water.
CELERY	Leaf spot or leaf blight	Bordeaux (20)	On young seedlings	Repeat on seedlings	Before or after transplanting	Two weeks later	* See foot note.

*NOTE—Keep leaves well covered in plant bed. Repeat every two weeks until celery is banked. Substitute No. 22 for later sprayings to avoid discoloration.

Spray Calendar for Vegetables (Continued)

WHAT TO SPRAY	FOR WHAT TO SPRAY	WITH WHAT TO SPRAY	WHEN TO SPRAY				REMARKS AND CAUTIONS
			FIRST SPRAYING	SECOND SPRAYING	THIRD SPRAYING	FOURTH SPRAYING	
CUCUMBER	Anthrachnose	Bordeaux (20)	When plants begin to vine	Two weeks later	Two weeks later	Two weeks later	Repeat as necessary.
	Downy mildew	Bordeaux (20)	July 25 to Aug. 1	Eight to ten days later	Eight to nine days later	Eight days later	Repeat at weekly intervals.
	Cucumber beetle	Arsenate of lead in Bordeaux (20)	Soon as plants appear	Week later	Week after second	Week after third	Week after fourth
POTATOES	Early blight	Bordeaux (20) or (33)	When plants are 6 inches high	Two weeks later	Two weeks later	Two weeks later	Seed selection desirable.
	Late blight	Bordeaux (20) or (33)	July 15-20	Two weeks later	Two weeks later	Two weeks later	Repeat at two-week intervals until crop is mature.
	Blister beetle	Whale-oil soap	When beetles appear	Repeat if necessary	.....	.....	Use 1 pound soap to 6 gallons of water.
	Colorado beetle	Arsenicals alone or in Bordeaux (20)	When beetles or young appear	As for first	As for first	.....	Arsenate of lead, 3 lbs. to 50 gallons of water, for Colorado beetle alone.
	Flea beetle	Bordeaux (20) or (33) combined with 4	When beetles appear	Repeat if necessary	As for first and second	.....
SUGAR BEETS	Leaf spot	Bordeaux (20)	With first appearance of spots	Two or 3 weeks later	Two or 3 weeks later	Three weeks later if needed	
	Blister beetle	Whale-oil soap	When they appear	.....	.....	.....	Use 1 lb. to 6 gals. of water.
TOMATO	Anthrachnose	Bordeaux (20)	Soon after fruit begins to set	Three weeks later	Three weeks later	Three weeks later	
	Leaf blight	Bordeaux (20)	Two weeks after transplanting	Three weeks after first	Three weeks later	Three weeks later	

Spray Calendar for Shade Trees, Flowers, &c.

ASTER	Blister beetle	Whale-oil soap, or dilute chloro-naphtholeum	When beetles appear	.....	.....	.....	Use 1 pound soap to 6 gallons water.
CARNATION	Leaf or calyx mold	Bordeaux 20 or $\frac{1}{2}$ of 24	Upon appearance of fungus	Two weeks later	Two weeks later	Repeat if needed	Begin early before the calyces are ruined.
	Leaf spot	Bordeaux 20 or 24	Upon appearance of fungus	Two weeks later	Two weeks later	Cover foliage well	
CATALPA	Leaf spot	Bordeaux 20	Upon appearance of fungus	Two or 3 weeks later	Repeat if necessary	Cover foliage well	
CHESTNUT	San Jose scale	17 or 16	Before buds open				
	Leaf spot	Bordeaux 20	When leaves are half grown	Three weeks later			
CINERARIA (Dusty Miller)	Mildew	Bordeaux 20 or 24	When mildew appears in Spring	Two weeks later	Repeat if necessary		
CHRYSANTHEMUM	Leaf spot	Bordeaux 35 or $\frac{1}{2}$ of 24	July 1	Two weeks later	Repeat if necessary		
COTTONWOOD	Beetle	See poplar					
ELM	Leaf spot	Bordeaux 20	When leaves are half grown	Three weeks later			
	Powdery mildew	Lime-sulphur or Bordeaux	With first appearance of mildew in midsummer	Three weeks later			
	Flea beetle	Bordeaux 20 or 33 combined with 4					
	Lecanium scale	As maple for terrapin scale					
	Leaf beetle	Ars. of lead 1 lb. to 10-15 gallons, also bands of burlap and tanglefoot, band below	When larvæ appear	.....	.....	.....	Repeat every 3 weeks until disappearance.
MAPLE	Caterpillars	Arsenicals	When seen	.....	.....	.....	Keep trunks whitewashed from early Summer till Fall, 2 or 3 applications.
	Borers	Whitewash trunks	.....	.....	.....	.....
	Terrapin scale	Kerosene emulsion 1 part to 6 or 8 parts water or miscible oils 1 part to 12 parts water	When buds are swelling				

Spray Calendar for Shade Trees, Flowers, &c. (Continued.)

WHAT TO SPRAY	FOR WHAT TO SPRAY	WITH WHAT TO SPRAY	WHEN TO SPRAY				REMARKS AND CAUTIONS
			FIRST SPRAYING	SECOND SPRAYING	THIRD SPRAYING	FOURTH SPRAYING	
OAK	Anthraxnose Caterpillars	Bordeaux 20 or 17 (See maple)	Just as buds are opening, 20 or 17	Two weeks later if necessary			
ROSE	Leaf spot Mildew Slug	Bordeaux 20 or 1/2 of 24 Lime-sulphur as for apple or No. 27 Arsenicals in Bordeaux 35 or hellebore	With first appearance of fungus With first appearance of mildew On appearance of slugs	Two or 3 weeks later Two or 3 weeks later Repeat if needed	Repeat if necessary Threeweekslater if needed		Bordeaux shows on plants. When Bordeaux is used for leaf-spot, other spray may not be needed.
SYCAMORE	Anthraxnose Powdery mildew	As for oak Lime-sulphur or No. 27	With first appearance, about July 15	Threeweekslater on new growth	Repeat second		Most troublesome on Oriental variety.

NOTE: We are indebted to Ohio Experimental Station Bulletin No. 232 and Storrs Experimental Station Bulletin No. 56 for this information.

Solutions for Spraying

INSECTICIDES

(1) Paris Green

Paris green..... 8 ounces
Quicklime..... 16 to 24 ounces
Water..... 50 gallons

Slake the lime in about a pint of water and sprinkle in the Paris green slowly. When the lime is all slaked and the whole is in the form of a paste, add more water and strain into the spray barrel with the remainder of the water. The solution should be thoroughly agitated during application.

The strength of Paris Green varies so much that it is necessary for you to test first tankful for each new lot you buy. Many practical men are in the habit of using much stronger mixtures.

(3) Commercial Arsenate of Lead

Arsenate of lead.... 2 to 5 pounds
Water..... 50 gallons

Mix thoroughly the arsenate of lead in a small quantity of water, strain into the spray barrel, and add the remainder of the water. To insure a uniform application, the solution should be thoroughly agitated while being applied. The stock supply of arsenate of lead may be prevented from drying out by keeping it covered with water.

Arsenate of lead may be regarded as the standard insecticide for the treatment of chewing insects. It mixes with water more readily, sticks to the foliage better, and remains in suspension longer than Paris green. It is probably a little more expensive, but is decidedly more effective, and fewer applications will often suffice. It usually comes in the form of a paste and may be purchased for about 8 to 12 cents per pound by the hundred.

(4) Arsenate of Lead (Home-Made)

Arsenate of soda (50% strength)..... 4 ounces
Acetate of lead..... 11 ounces
Water..... 50 gallons

Dissolve the arsenate of soda in two quarts of water in a wooden pail, and the acetate of lead in four quarts of water in another wooden pail. Warm water will hasten the dissolving process, but it is not necessary. When both are thoroughly dissolved strain into the spray barrel and add the remainder of the water. Fifty gallons of Bordeaux mixture may be used in place of water.

(6) Hellebore

White hellebore..... 1 ounce
Water..... 2 gallons

Steep the hellebore in a pint of water and gradually add the rest of the water. It loses its poisonous properties on exposure to the air. For this reason it is largely used on cabbage plants when they are forming heads.

(7) Resin-Lime Mixture

Pulverized resin..... 5 pounds
Concentrated lye or potash..... 1 pound
Fish oil..... 1 pint
Water..... 5 gallons

Dissolve the resin with the oil in a large iron kettle over a fire. When the resin has all dissolved and the mixture has become partially cooled, slowly add the potash while stirring violently. Add about two gallons of water and boil for about an hour, or until it will dissolve readily in cold water. When this condition is attained add the remainder of the water, or enough to make five gallons. Keep this as a stock solution. For use, take

Stock solution..... 1 gallon
Water..... 16 gallons
Milk of lime (whitewash) 3 gallons
Paris green..... 4 ounces

The object of this preparation is to obtain an adhesive material, which will cause the poison to stick to smooth leaves. It may also be used with Bordeaux mixture (No. 31) in the proportion of 2 to 48. It is especially useful in spraying cabbage and asparagus.

Commercial resin fish-oil soap may be purchased at a cost of about three cents per pound. It is used at the rate of four or five pounds to 50 gallons of arsenical solution or Bordeaux mixture. At this rate it is probably cheaper and at the same time more convenient than the home-made formula.

(8) Bait for Cut-Worms

Bran..... 20 pounds
Middlings..... 10 pounds
White arsenic..... 3 pounds
Cheap syrup..... 1 gallon

Mix thoroughly and add just enough water to moisten the mass. A very little scattered about the plants will kill cut-worms. It should not be put where poultry will get it. Six pounds of Paris green or 15 pounds of arsenate of lead may be substituted for the arsenic.

(10) Common Soap

Common hard soap..... 2 pounds
Water..... 8 gallons

After dissolving the soap in about one gallon of hot water, add the remainder of the water, and spray on the foliage to kill red spiders, plant lice, and other soft-bodied sucking insects. A solution of whale-oil soap is frequently used as a winter wash in the following proportions:

(11) Whale-Oil Soap

Whale-oil soap..... 2 pounds
Hot water..... 1 gallon

(12) Kerosene Emulsion

Hard soap..... 1/2 pound
Hot water (soft)..... 1 gallon
Kerosene..... 2 gallons

Cut the soap in thin slices, dissolve in the water, remove from the fire and pour it into the kerosene while hot. Churn thoroughly, or pump into itself with a force pump until a creamy emulsion is formed which will mix readily with cold water. For killing plant lice, or other soft-bodied sucking-insects on foliage, dilute eight to fifteen times.

(16) Soluble or Miscible Oil

Some commercial houses make brands of oil that readily emulsify with cold water and are used in Winter at different dilutions for San Jose scale and also as Summer applications. Some of these are valuable, and if used with care, are recommended as worthy of trial.

(17) Lime-Sulphur Wash

Stone lime..... 15 to 20 pounds
(Hydrate of lime, one-fourth more)
Flowers of sulphur..... 15 pounds
Water..... 50 gallons

Slake the lime in a small quantity of hot water, gradually adding and stirring in the sulphur. Dilute mixture with twelve gallons of water and boil in an iron kettle or cook by steam in a covered tank or barrel for one hour or longer. Fill with water to the required 50 gallons. Strain the wash through a fine mesh strainer and apply hot. In using an iron kettle, keep the mixture vigorously boiling and thoroughly stirred to prevent caking and burning of the materials. Wash, cooked by steam, is more easily prepared and better made.

Apply wash in Spring before buds open or in Fall after leaves drop. Cover all parts of the tree with a heavy coat of the wash. If a single application is made per year for scale insects, especially for San Jose scale, it is advised that the treatment be given in the early Spring. Where infestation is excessive, one spraying should be given in the Fall after the leaves drop, and a second the following Spring before the leaves appear. Also in case of large orchards it may be necessary to commence work in the Fall so as to insure its completion before vernalization in the Spring. Cover every bit of bark on every tree to insure success.

This remedy is perfectly safe in anybody's hands, if used during the dormant period. It is also a fungicide and controls peach-leaf curl as well as San Jose scale.

This is one of the early formulae for making lime-sulphur solution. The only objection to it is the great quantity of sediment, which must be removed by straining. Even when carefully strained, it frequently clogs pumps and nozzles with accumulations of dirt. Notwithstanding this drawback, some of our best orchardists have returned to its use after a few years' trial of the commercial mixtures, being convinced that it is more effective for controlling scale insects.

Solutions for Spraying (Continued)

FUNGICIDES

(20) Bordeaux Mixture

Copper sulphate (blue vitriol)..... 4 pounds
Fresh stone lime..... 4 pounds
Water..... 45 to 50 gallons

Dissolve the copper sulphate in hot water or from a coarse bag suspended in cold water. Slake the lime slowly in part of the water. When slaked, dilute to about 20 gallons and add the copper sulphate solution, diluted to about 20 gallons, stirring the mixture. Strain into the sprayer and add additional water to make 50 gallons, or to fill the barrel if a 50-gallon spray tank is used. Stock solutions of copper sulphate and of lime may be made up in the proportion of two pounds of either to a gallon of water. To make up the above formula from such stock solution, use two gallons of the copper sulphate solution and two gallons of the lime water. These solutions should never be brought together in concentrated form. If insufficient lime is used there is danger of burning the foliage. There should be no trouble from this source if a good quality of fresh lime is used. A simpler test may be made by dipping a bright steel knife into the liquid. A film of copper on the knife blade indicates insufficient lime.

(21) Soda Bordeaux Mixture

Copper sulphate..... 4 pounds
Commercial caustic soda, soda lye (*sodium hydroxid*), slightly in excess so that mixture is alkaline—according to strength, 1 lb. 5 oz. to 1 lb. 8 oz. by testing.
Water to make 50 gallons.
For use instead of ammoniacal copper carbonate.

Dissolve the copper sulphate in water as for the regular Bordeaux mixture, and add just enough soda lye dissolved in water to neutralize the mixture. Great care should be observed to add just the right amount, neither more nor less. The neutral point may be determined by the use of test paper. After adding part of the lye, test with red litmus paper. Continue to add lye until the paper commences to turn blue. Some prefer to add about a pound of lye and then neutralize with about half a pound of lime.

This formula is not so conveniently made up as the regular Bordeaux mixture, but is used when one wishes to avoid the discoloring of maturing fruits or of ornamental plants. When carefully made, good results may be expected, but on account of the injury, which usually results from failure to use just the proper amount of soda, it is not generally recommended.

WARNING—In each case of change of grade or brand of commercial caustic soda, it will be necessary to test the strength. Keep the mixture well agitated.

(22) Ammoniacal Copper Carbonate

Copper carbonate..... 5 ounces
Ammonia (about 26° Baumé)..... 3 pints
Water..... 50 gallons

Dilute the ammonia with five or six quarts of water. Make a paste of the copper carbonate with a little water. Slowly pour the diluted ammonia over the paste, using just enough of the latter to dissolve the former. About the amount mentioned in the formula will be required to dissolve the paste, but it is not advisable to apply more than is necessary. If any copper carbonate remains undissolved, add more ammonia.

This formula is used for the same purpose as the soda Bordeaux. It is not usually so effective as

either the regular or the soda Bordeaux, but it possesses the quality of being free from sediment and is more easily prepared than the latter. It loses its strength on standing exposed to the air. It therefore should not be made up until required for use, or, if made up in advance, should be kept in air-tight containers.

To make copper carbonate: Dissolve ten pounds of copper sulphate (blue vitriol) in ten gallons of water, also twelve pounds of carbonate of soda in same quantity of water. When cool, mix the two solutions slowly, stirring well. Allow the mixture to stand twelve hours and settle, after which pour off the liquid. Add the same quantity of water as before, stir and allow to stand the same length of time. Repeat the operation, after which drain and dry the blue powder, which is copper carbonate.

(23) Potassium Sulphide

Potassium sulphide..... 3 ounces
Water..... 10 gallons

As this mixture loses strength on standing, it should be made up just before it is required for use. It is used chiefly for the control of powdery mildew of the gooseberry and for certain diseases of greenhouse plants, such as carnation rust, rose mildew, etc.

(24) Copper Sulphate

Copper sulphate... 2 to 4 pounds
Water..... 30 to 50 gallons

Dissolve the copper sulphate in hot water or from a coarse bag suspended in cold water. When dissolved, it is ready for use. This formula is used to some extent on dormant peach trees for the control of leaf curl. When peaches are sprayed with the lime-sulphur wash, this treatment is unnecessary.

CAUTION—This solution will injure foliage. It can be used only before the buds open.

(27) Self-Boiled Lime-Sulphur Mixture

Stone lime (only)..... 10 pounds
Flowers of sulphur..... 10 pounds
Water to make 50 gallons.

An 8-8-50 strength is also used.

It is best to prepare the mixture in large lots for at least 200 gallons of spray, using 40 lbs. lime and 40 lbs. sulphur—so as to get enough heat to produce a violent boiling for a few minutes. Place the lime in a barrel and pour on enough water (about 3 gallons to every 20 lbs.) to start the slaking of the lime and to hold up the sulphur. Then add the sulphur after working through a sieve to break up the lumps, meanwhile stirring thoroughly, and finally add enough water to slake the lime into a paste. Considerable stirring is necessary to prevent caking on the bottom. If mixture tends to become sticky, a little more water may be added. After the violent boiling produced by the slaking of the lime is over, the mixture should be diluted ready for spraying, or at least enough cold water added to stop the cooking—5 to 15 minutes being required for this, according to whether the lime is quick acting or sluggish. The intense heat in boiling seems to produce the desired mechanical mixture of the lime and sulphur. If allowed to stand too long before dilution, the sulphur tends to unite with the lime, and at the end of 30 to 40 minutes enough reddish liquid is produced to burn peach foliage and even apple foliage in some cases. Strain through a sieve of about 20 meshes to the inch to remove coarse particles of lime, but all of the sulphur should be worked through the strainer. For the 10-10-50 strength, dilute to 200 gallons. For other strengths, use a different dilution. The large disc nozzles are successfully used in the application of this spray.

CAUTION—While this may be used on the peach in foliage, and upon other fruits, care should be exercised in the preparation of this mixture to avoid the formation of soluble sulphides as by use of hot water or allowing to stand before dilution, since these result in foliage injury from the spray

(30) Bordeaux Mixture and Arsenate of Lead

Arsenate of Lead (No. 3)..... 2 to 5 pounds
Bordeaux mixture (No. 20)..... 50 gallons

This is the standard summer spray for fruit trees and for many other crops. Bordeaux mixture, when used with arsenate of lead, is more adhesive, and owing to the impervious nature of the latter will remain on the foliage much longer than when used alone. The home-made arsenate of lead (formula 4) may be used in this combination by adding the dissolved arsenate of soda and acetate of lead to 50 gallons of Bordeaux mixture.

(31) Resin Bordeaux

Resin-lime mixture, stock solution (No. 7)..... 2 gallons
Bordeaux mixture (No. 20)..... 48 gallons

This combination is valuable for its adhesiveness. It is used largely for spraying cabbage, onions and asparagus. Arsenate of lead or Paris green may also be used with this combination, and thus produce an adhesive fungicide and insecticide.

(33) Bordeaux Mixture and Iron Sticker

Copper sulphate (blue vitriol)..... 2 pounds
Iron sulphate (copperas)..... 2 to 3 pounds
Quicklime..... 4 to 5 pounds
(Of dry air-slaked lime or hydrate of lime one-fourth more.)
Water to make 50 gallons.

Proposed and recommended as substitute for Bordeaux 20 upon certain vegetables, especially potatoes. The iron sulphate is precipitated by the lime and serves as a dilution sticker. The spray is rusty colored by reason of this iron compound.

CAUTION—Do not leave solution of iron sulphate standing beyond a second or third day, better to make fresh for each day.

(34) Half-strength Bordeaux Mixture and Iron Sticker

Copper sulphate (blue vitriol)..... 1 pound
Iron sulphate (copperas)..... 2 pounds
Quicklime..... 3 to 4 pounds
Water to make 50 gallons.

For use in late Spring and midsummer applications, especially upon apple; also available on pear and raspberry. Is a safe carrier for arsenicals.

(35) Bordeaux Mixture

Copper sulphate..... 2 pounds
Quicklime..... 2 pounds
(Of dry-air slaked lime or hydrate of lime one-fourth more)
Water to make 50 gallons.

For use on such trees as have foliage injured by Bordeaux 20.

Pyrethrum

Pyrethrum is usually applied as a powder, with a bellows but may be used as a spray at the rate of one ounce to two gallons of water. Poisonous to insects but not to higher animals.



A very handy rig for large bushes and small trees



Spraying home trees with No. 191



No. 1941-T R in a practical job

These outfits can also be used for white-washing, cold-water painting, odd jobs of pumping, sprinkling, etc., in addition to the usual spraying uses in orchard, field, home and garden.

We also make full line of Traction Sprayers for potatoes, tomatoes, asparagus, celery and tobacco and specials for grain, pickles and cotton. Ask us for new booklet, "Spraying Vines, Trees and Bushes." It is free

IRON AGE Bucket, Barrel and Power Sprayers

are made up of unit lines each of which can be built up as you need additional equipment or use any part of a complete outfit, for smaller jobs.

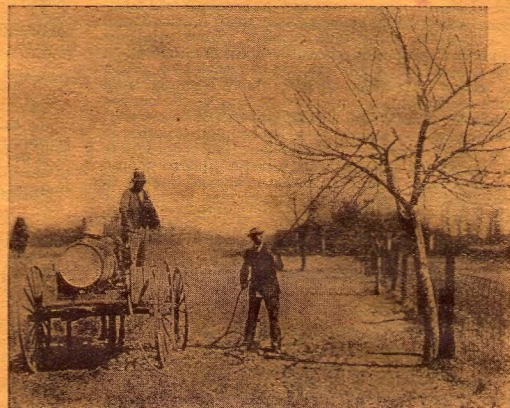
For instance, **Bucket Sprayers** are furnished with or without bucket and can be placed in a 20-gallon barrel and mounted on a truck. 100 pounds pressure when spraying.

Vertical Barrel Pumps are made in two sizes, furnished with or without 50-gallon barrel, and mounted on convenient truck or with 4 row attachment for field crops of limited acreage. 100 to 150 pounds pressure.

Horizontal Barrel Sprayers (50 gallon) are furnished with single or double acting pumps shipped ready for any wagon, cart, etc., or mounted on a steel truck, with or without engine, or mounted on short or long skids, with or without engine and with necessary pump jack to connect to your engine. Also furnished with four-row attachment for field crops or six-nozzle attachment for grain. 125 to 150 pounds pressure.

Horizontal Tank Sprayers (100 gallon) are furnished plain or mounted on steel truck or with engine on a skid truck, or with or without engine on short or long skids. 125 to 200 pounds pressure.

Power Sprayers, 50 and 100 gallon sizes are made from the last-named groups and we also make 150 and 250 gallon rigs. Double acting pump with 2-H engine maintains 200 lbs. pressure.



A simple operation—soon done, well done, at very little expense



A handy rig for a cart. Pressure enough to do the work right



Spraying in early Spring with small portable power outfit